11

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/265,183	03/09/1999	MASAHARU TOMIOKA	990160/LH	4232

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EXAMINER	
QUASH, ANTHONY G	
ART UNIT	PAPER NUMBER
2881	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/265,183	Applicant(s) TOMIOKA, MASAHARU	
	Examiner Anthony Quash	Art Unit 2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 November 2002*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-7 and 10-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-7 and 10-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3,5-7,10-12,14-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stock [287], in view of G. J. Brakenhoff et al; "Femtosecond Pulse Width Control in Microscopy by Two-Photon Absorption Autocorrelation" and further in view of Denk [613]. As per claims 1,14, and 18-20, Stock [287] teaches a laser beam source for emitting a pulse laser beam for exciting a sample to cause a fluorescent light by multi-photon excitation phenomenon, a detector for detecting fluorescent light, an optical system for forming an optical path of said pulse laser beam for guiding said pulse laser beam. It also teaches a pre-chirp compensator arranged on said optical path for preventing a pulse width of said pulse laser beam from widening and a plurality of objective lenses capable of being selectively arranged on said optical path for collecting the pulse laser beam on the sample. See Stock [287] abstract, fig. 1, and columns 3,6 & 7. In addition, Stock [287] teaches the optical components of the pre-chirp compensator causing components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths. See Stock [287] col. 1 lines 45-67 and col. 2 lines 1-20. Although Stock [287] does not explicitly teach the optical correcting element for adjusting the optical path length being adjustable by applying different voltages or different pressures, it does

teach means provided for adjusting/correcting the optical path length. See Stock [287] column 3, col. 4 lines 1-20, col. 6 lines 60-67, and col. 7 lines 1-15 and 60-67. Therefore, it would have been an obvious matter of design choice to a person of ordinary skill in the art at the time the invention was made to have the optical correcting element for adjusting the optical path length be adjustable by applying different voltages or different pressures, since applicant has not disclosed that having the optical correcting element for adjusting the optical path length be adjustable by applying different voltages or different pressures solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with correcting means described by Stock [287].

Stock [287] also does not teach providing a station for placing a sample to be observed. However, G. J. Brakenhoff does teach providing a station for placing a sample to be observed, and a correcting mechanism including optical correcting means for correcting an optical path length of said optical path to cause the pulse width of said pulse laser beam to be constant. See G. J. Brakenhoff p. 255 column 1, p. 257 column 2, and p. 258 column 1. Also see Stock [287] col. 7 lines 60-67. In addition, G. J. Brakenhoff teaches that the pre-chirp compensator can be adjusted. See G. J. Brakenhoff p. 258, col. 1 paragraph 3. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to preset the pre-chirp compensator in order to reduce the broadening of the beam as taught in G. J. Brakenhoff. Denk [613] also teaches a laser-scanning microscope, a fluorophore having appropriate emission, a detector, and a station for placing the sample. See

Denk [613] columns 9-10. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a station for placing a sample to be observed, and a correcting mechanism including optical correcting means for correcting an optical path length of said optical path to cause the pulse width of said pulse laser beam to be constant in order to provide interactive control of the pulse width at the focal point.

As per claims 2,15, Stock [287] teaches an interlocking mechanism for causing the correcting mechanism to be interlocked with said objective lenses. It also teaches microscope being comprised of a plurality of objective lenses. See Stock [287] column 3. Also see G. J. Brakenhoff p. 253 column 2. As to the applicant's claim that correcting mechanism was to be interlocked with switchover of the objective lens. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the correcting mechanism interlocked with switchover of the objective lens, since it has been held that the provision of adjustability, where needed, involves only routine skill in the art.

As per claim 3, Stock [287] teaches the optical correcting means arranged on said optical path in a position where said pulse laser beam forms a parallel luminous flux. Stock [287] also teaches optical correcting means including a plurality of optical correcting elements capable of being arranged selectively on said optical path to cause the optical path length of said optical path to be constant in accordance with the respective optical path lengths of said objective lenses. See Stock [287] columns 3 & 4. Also see G. J. Brakenhoff p. 258 column 2.

As per claims 5,6,7, Stock [287] and G. J. Brakenhoff teach all aspects of the claims except for the correcting mechanism including a rotor and a slide supporting said optical correcting elements. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a rotor and a slide to support optical correcting elements since it was known in the art of microscopes to do so. Also see Ichic [342] fig. 2. It also would have been obvious to one of ordinary skill in the art at the time of the invention to have the correcting elements and said objective lenses be supported by the same supporting member and moved together in order to ensure that the proper distance between the correcting element and the objective lenses are maintained at all times which will then aid in the focusing of the device.

As per claim 10, Denk [613] teaches the optical system further comprising a scanning mechanism. See Denk [613] column 11.

As per claim 11, it would have been obvious to one of ordinary skill in the art at the time of the invention to position the optical correcting means between the scanning unit and the pre-chirp compensator in order correct the beam before it reaches the compensator.

As per claim 12, Denk [613] teaches the optical system including a portion for forming an optical path for guiding said fluorescent light to said detector. See Denk [613] column 5,10 and figs. 1,1A.

As per claim 16, G. J. Brakenhoff teaches an objective lens being arranged on the said optical path for collecting the pulse laser beam on the sample and an optical element inserted between said pre-chirp compensator and said objective lens. See G.

J. Brakenhoff p. 254 fig. 2. However, it does not explicitly state that there should be a plurality of objective lenses capable of being selectively arranged on said optical path nor does it state that the optical element should be flat. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a plurality of objective lenses capable of being selectively arranged on said optical path in order to allow one to change the objective lens so without disturbing the rest of the apparatus in order to better focus the beam. It also would have been obvious to one of ordinary skill in the art at the time the invention was made to make the optical element flat since discovering the optimum shape would only involve routine skill in the art.

As per claim 17, Stock [287] teaches the optical element being a prism. See Stock [287] col. 11 lines 1-45. Also see Zavisian [010] col. 4 lines 30-55.

As per claim 21, Stock [287] teaches the plurality of optical correcting elements being adapted to be selectively placed on said optical path in accordance with which of the objective lenses is selectively placed on the optical path in a one-to-one corresponding relationship. See Stock [287] col. 60-67.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stock [287], G. J. Brakenhoff and Denk [613] as applied to claim 1 above, and further in view of White [289]. Stock [287], G. J. Brakenhoff and Denk [613] teach all aspects of the claimed invention except for the laser beam being detected that has already been transmitted through the sample. However, White [289] does teach a laser beam being detected after transmission of the beam. See White [289] abstract, fig. 1, and column 1. Therefore, it would have been obvious to a person of ordinary skill in the art at the time

the invention was made to position a detector after the specimen in order to determine the amount of light that passes through the specimen as taught in White [289].

Response to Arguments

Applicant's arguments filed 11/25/02 have been fully considered but they are not persuasive. In response to the applicants' argument that prior art does not teach the optical elements of the pre-chirp compensator causing the components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths, the examiner would like to draw the applicants' attention to Stock [287] col. 1 lines 45-67 and specifically to col. 2 lines 1-20. Here Stock [287] states that, "Propagation through a common optically transparent material used to deliver optical signals, such as glass, will generally result in very small loss. However, due to the frequency dependent refractive index n (ν) of the medium, which gives the velocity, v, 2 of propagation of the optical signal by the relationship v=c/n n (ν), where c is the speed of light in a vacuum, different wavelengths, λ, experience different velocities in the material, where wavelength is related to frequency by λ=c/vν. This effect is referred to as chromatic dispersion. Through the interaction of a pulsed optical signal and such a material, pulse broadening can occur due to group velocity dispersion (GVD). This effect causes the lower frequency components and the higher frequency components of the bandwidth to arrive at different times after passing through the dispersing medium. The effect may be that the lower frequency components arrive earlier or later, depending upon the sign of the dispersion. In glass, for wavelengths

shorter than the zero-dispersion wavelength (~1300 nm), the sign of the dispersion is positive, and higher frequencies of the optical pulse travel more slowly than lower frequencies. Above the zero-dispersion wavelength, the sign of the dispersion is negative, and lower frequencies of the optical pulse travel more slowly than higher frequencies. Therefore, any optical element through which the ultrashort optical pulse is transmitted may potentially have a distorting effect. Dispersion manipulation may be performed with several well known optical elements and systems. These include glass prisms, diffraction gratings, fiber gratings and optical fiber." This means that high frequency corresponds to short wavelength, and low frequency corresponds to long wavelength. Therefore, the shorter wavelengths are emitted earlier than the longer wavelengths.

In response to the applicants' argument that prior art does not teach the pre-chirp compensator being present, the examiner would like to draw the applicants' attention to G. J. Brakenhoff p. 258, col. 1 paragraph 3. Here G. J. Brakenhoff states that, "The TPA autocorrelation technique presented in this paper permits measurement of the actual pulse width at the focal point of a high-NA lens. Furthermore, by adjustment of the pre-chirp compensation, any pulse broadening induced by the microscopic set-up can be almost reversed...." Therefore it is would have been obvious to one of ordinary skill in the art at the time the invention was made to preset the pre-chirp compensator in order to obtain a desired/reduced broadening.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Quash whose telephone number is (703)-308-6555. The examiner can normally be reached on M-F from 9 a.m. to 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee, can be reached on (703)-308-4116. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

A. Quash 2/20/03

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